Imaging Nanoscale Structure in Biominerals:

New Results and Challenges in Synchrotron Science

Welcome! and Thank you!

NSLS Users' Executive Committee
Center for Functional Nanomaterials
DOE Basic Energy Sciences

NSLS
NATIONAL SYNCHROTRON LIGHT SOURCE

Center for Functional Nanomaterials
Brookhaven National Laboratory

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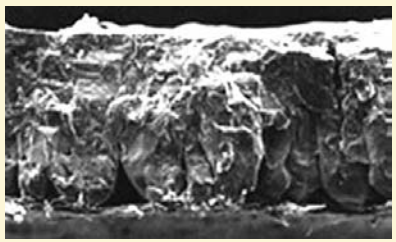
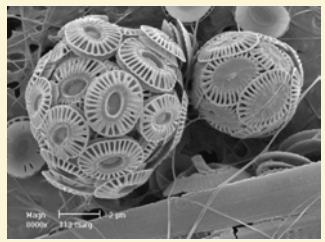
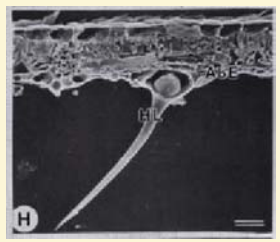
Biominerals were among the *first* materials imaged by x-rays.

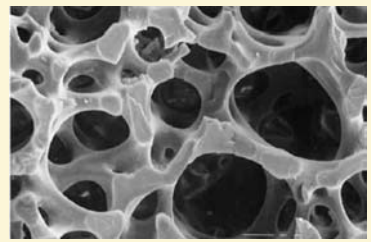
Now, synchrotron techniques illuminate:

- mineral phase stabilized by an organism
- sub-micron architecture
- composition of organic matrix
- kinetics at the mineral-organic interface









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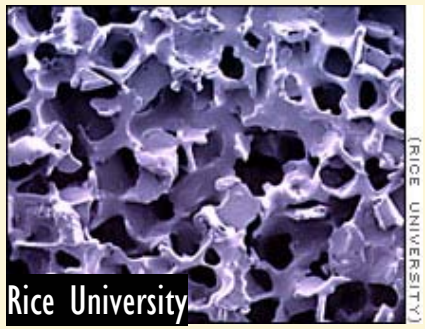
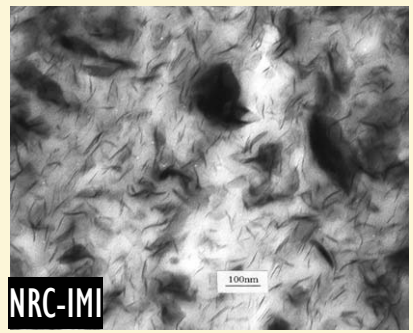
... and, providing an inspiration for new functional nanomaterials.

For example:

- biosilica templates converted to metal oxides
- nanoporous biomedical scaffolds to mimic bone and promote cell adhesion
- strong polymer-ceramic nanolaminates





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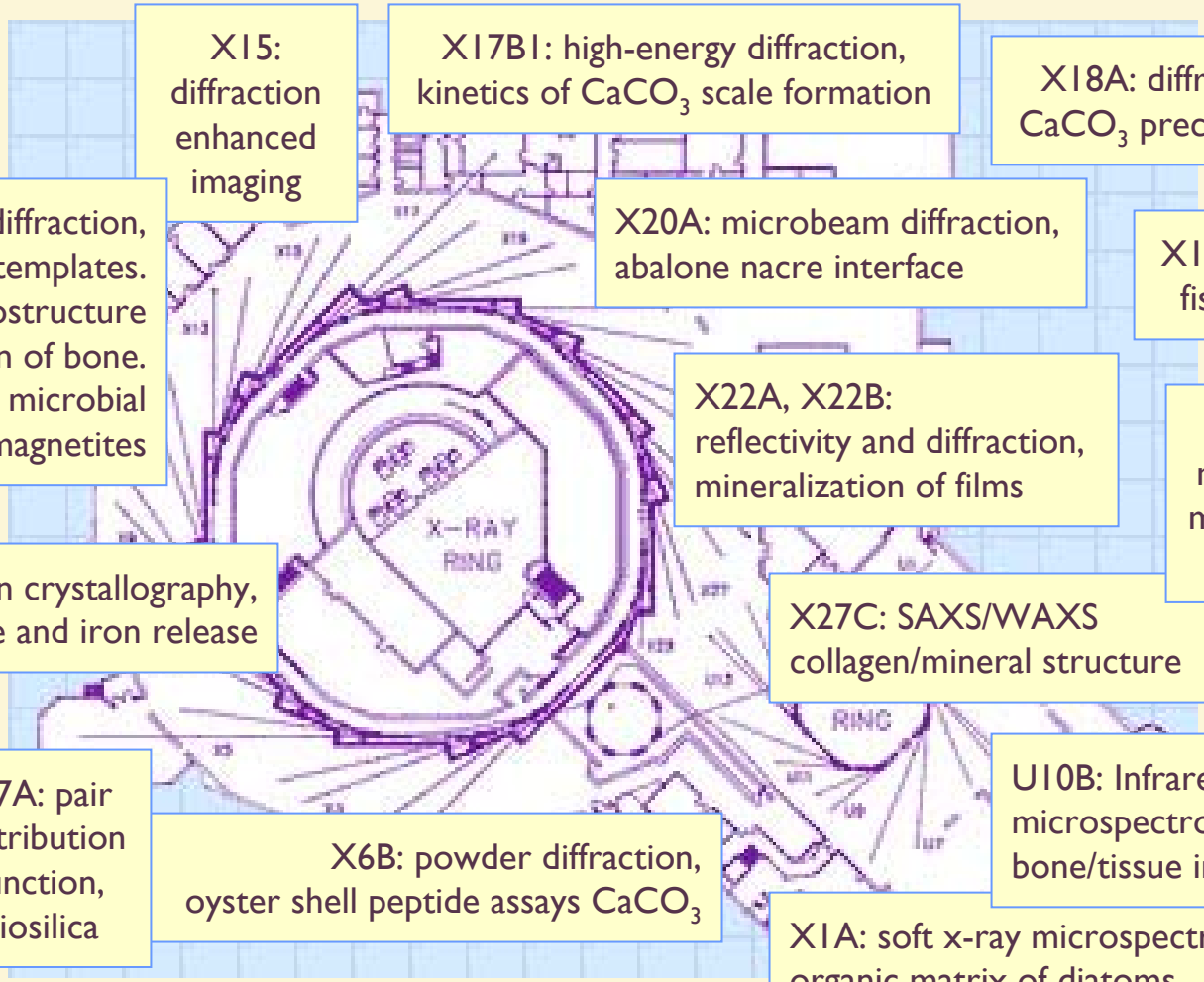

X15: diffraction enhanced imaging

X17B1: high-energy diffraction, kinetics of $CaCO_3$ scale formation

X18A: diffraction, $CaCO_3$ precipitation

X14A: surface diffraction, minerals at organic templates. Diffraction, microstructure and nanoindentation of bone. Powder diffraction, microbial synthesis of magnetites

X20A: microbeam diffraction, abalone nacre interface

X19A: XAFS, fish otolith

X22A, X22B: reflectivity and diffraction, mineralization of films

X26A: microbeam, mollusk shell organics

X12C: protein crystallography, ferritin structure and iron release

X27C: SAXS/WAXS collagen/mineral structure

X7A: pair distribution function, biosilica

X6B: powder diffraction, oyster shell peptide assays $CaCO_3$

U10B: Infrared microspectroscopy, bone/tissue imaging

X1A: soft x-ray microspectroscopy, organic matrix of diatoms

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Program of short talks, afternoon session:

- Zhong Zhong, NSLS
- Meghan Ruppel, NSLS
- Karthik Subburaman, SBU
- Seo-Young Kwak, NSLS

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